Suitability Evaluation of the Diet Quality Screening Tool

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Introduction

Eating a healthy diet is an essential protective factor for chronic disease onset and management.[1] Therefore, assessing dietary scores on risk of total chronic disease is necessary to identify the most scientifically sound dietary recommendations. From an etiologic standpoint, pooling all chronic diseases may not be appropriate. However, from a public health perspective, the prevention of all chronic diseases is important. Additionally, one of the best predictive measures of chronic disease risk and mortality is the Alternative Healthy Eating Index (AHEI) research model[2] (Figure 1). The AHEI measures diet quality using nine dietary components (Table 1). Although the AHEI was designed as a research index for use by scientists and public policymakers, this index can also serve as a useful screening tool for quickly assessing patients' diet quality as a prelude to behavioral counseling by health professionals to prevent lifestyle-related diseases.

In clinical and community settings, dietary assessment is important for providing individualized dietary advice and is essential for evaluating the success of interventions aimed at improving dietary habits relating to the prevention of common adulthood chronic diseases. Brief dietary screening tools have been developed to assist with dietary assessment in clinical and community practice. These tools take the form of a brief questionnaire that can be self-completed prior to or administered during a consultation. The answers allow health professionals and patients to quickly identify whether a diet is appropriate or whether there are areas of concern. Dietary changes, based upon the patient's current dietary habits, can be discussed and food-based dietary goals set. For dietary tools to be useful in clinical practice, they need to be interpretable with minimal nutrition knowledge, quick to complete and easy to score. They must provide immediate guidance on healthy dietary changes or allow health professionals to quickly identify patients who may benefit from more intensive dietary counseling.

Printed health information material is useful in enhancing understanding of health knowledge in individuals and their families. However, such material needs to be suitable for the patients. Doak et al. developed the Suitability of Assessment of Materials (SAM) to assess suitability qualities of printed health information materials[3]. SAM has been widely used by researchers. The aim of our research was to provide a SAM of the Diet Quality Screening Tool (DQST) (Figure 2). The DQST has been successfully validated for content validity[4].

Figure 1: Alternative Healthy Eating Index is predictive of chronic disease and mortality

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Alternative Dietary Indices Both Strongly Predict Risk of Chronic Disease[1–3]

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Abstract

The Healthy Eating Index-2005 (HEI-2005) measures adherence to the 2005 Dietary Guidelines for Americans, but the association between the HEI-2005 and risk of chronic disease is not known. The Alternative Healthy Eating Index (AHEI), which is based on foods and nutrients predictive of chronic disease risk, was associated inversely with chronic disease risk previously. We updated the AHEI, including additional dietary factors involved in the development of chronic disease, and assessed the associations between the AHEI-2010 and the HEI-2005 and risk of major chronic disease prospectively among 71,495 women from the Nurses' Health Study and 41,029 men from the Health Professionals Follow-Up Study who were free of chronic disease at baseline. During ≥24 y of follow-up, we documented 26,759 and 15,558 incident chronic diseases (cardiovascular disease, diabetes, cancer, or nontrauma death) among women and men, respectively. The RR (95% CI) of chronic disease comparing the highest with the lowest quintile was 0.84 (0.81, 0.87) for the HEI-2005 and 0.81 (0.77, 0.85) for the AHEI-2010. The AHEI-2010 and HEI-2005 were most strongly associated with coronary heart disease (CHD) and diabetes, and for both outcomes the AHEI-2010 was more strongly associated with risk than the HEI-2005 (*P*-difference = 0.002 and <0.001, respectively). The 2 indices were similarly associated with risk of stroke and cancer. These findings suggest that closer adherence to the 2005 Dietary Guidelines may lower risk of major chronic disease. However, the AHEI-2010, which included additional dietary information, was more strongly associated with chronic disease risk, particularly CHD and diabetes. J. Nutr. 142: 1009–1018, 2012.

Introduction

The Dietary Guidelines for Americans aim to provide science-based dietary advice that promotes good health and reduces major chronic diseases in the United States. The Dietary Guidelines are the most visible source of nutrition advice in the United States and the cornerstone of federal nutrition policy (1). Thus, it is imperative that they provide optimal guidance for preventing chronic disease. The Healthy Eating Index (HEI)[11], which quantified adherence to the 1995 Guidelines, was associated with only a modest reduction in risk of major chronic disease [fatal and nonfatal cardiovascular disease (CVD) or cancer and nontraumatic death] (2,3). In 2005, the 6th edition of the Dietary Guidelines and a new food guide, MyPyramid, were released, and the HEI-2005 quantifies adherence to these guidelines (4). Whether diets that are most consistent with the 2005 Dietary Guidelines are associated with lower risk of major chronic disease has not been evaluated.

The Alternate Healthy Eating Index (AHEI) was created in 2002 as an alternative to the HEI and was based on foods and nutrients predictive of chronic disease risk. Higher scores on the AHEI were strongly associated with lower risk of major chronic disease (5) as well as risk of CVD (5), diabetes (6), heart failure (7), colorectal (8) and estrogen-receptor-negative breast cancer (9), and total and cardiovascular mortality (10). Since the creation of the AHEI, substantial evidence has emerged to support a role of additional dietary factors in the development of chronic disease. Thus, we created the AHEI-2010, a new measure of diet quality that incorporates current scientific evidence on diet and health. In this analysis, we assessed the association between the AHEI-2010 and the HEI-2005 and risk of major chronic disease in the 2 large prospective cohorts in which the earlier scores had been evaluated.

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[3] Supplemental Tables 1–3 and Supplemental Methods are available from the "Online Supporting Material" link in the online posting of the article and from the same link in the online table of contents at http://jn.nutrition.org.
[11] Abbreviations used: AHEI, Alternate Healthy Eating Index; CHD, coronary heart disease; CVD, cardiovascular disease; HEI, Healthy Eating Index; HPFS, Health Professionals Follow-Up Study; NHS, Nurses' Health Study.
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Table 1: The AHEI-2010 scoring method and mean scores at baseline among women in the Nurses' Health Study (1984) and men in the Health Professionals Follow-Up Study (1986)[1]

Component	Criteria for minimum score (0)	Criteria for maximum score (10)	AHEI-2010 in women	AHEI-2010 in men
Vegetables,[2] *servings/d*	0	≥5	5.4 ± 2.4	5.6 ± 2.6
Fruit,[3] *servings/d*	0	≥4	3.4 ± 2.4	3.7 ± 2.6
Whole grains,[4] *g/d*	0		1.8 ± 1.7	2.4 ± 2.0
Women		75		
Men		90		
Sugar-sweetened beverages and fruit juice,[5] *servings/d*	≥1	0	3.0 ± 3.6	2.6 ± 3.5
Nuts and legumes,[6] *servings/d*	0	≥1	2.7 ± 2.5	4.1 ± 3.2
Red/processed meat,[7] *servings/d*	≥1.5	0	3.5 ± 3.1	3.1 ± 3.0
trans Fat,[8] *% of energy*	≥4	≤0.5	6.0 ± 1.7	7.8 ± 1.4
Long-chain (n-3) fats (EPA + DHA),[9] *mg/d*	0	250	6.2 ± 3.2	7.6 ± 3.1
PUFA,[10] *% of energy*	≤2	≥10	5.6 ± 2.0	4.7 ± 1.8
Sodium,[11] *mg/d*	Highest decile	Lowest decile	5.0 ± 3.2	5.0 ± 3.2
Alcohol,[12] *drinks/d*			5.1 ± 3.1	5.8 ± 3.3
Women	≥2.5	0.5–1.5		
Men	≥3.5	0.5–2.0		
Total	0	110	47.6 ± 10.8	52.4 ± 11.5

[1] Values are means ± SD unless otherwise noted. Researchers are invited to re-create and use the AHEI-2010 score in their own data. AHEI, Alternate Healthy Eating Index.
[2] Vegetable consumption has been associated with lower risk of cardiovascular disease (CVD) (28,29) and some cancers (52,53). Green leafy vegetables in particular may lower risk of diabetes (30). All vegetables on the FFQ were included, except for potatoes (including French fries) because they are not associated with lower risk of chronic disease risk in epidemiologic studies (52,61) and are associated with increased risk of diabetes (62). We considered 5 servings/d as ideal, which reflects the upper range of current dietary guidelines and is consistent with intervention studies of intermediates CVD risk factors (63). One serving is 0.5 cup of vegetables or 1 cup of green leafy vegetables (1 cup = 236.59 g).
[3] Fruit consumption has been associated with lower risk of CVD (28,29) and some cancers (52,53). We included only whole fruit in our definition, because fruit juice is not associated with lower risk of CVD (61,61) or cancer (61) and may increase risk of diabetes (64). We considered 4 servings/d to be ideal, which is consistent with the upper range of current dietary guidelines. One serving is 1 medium piece of fruit or 0.5 cup of berries (1 cup = 236.59 g).
[4] Greater consumption of whole grains is associated with lower risk of CVD (32), diabetes (31), and colorectal cancer (65). Conversely, refined grains are not associated with lower risk and may increase risk of diabetes, coronary heart disease (CHD), and other chronic diseases (32,37,38). We used grams of whole grains, which accounts for the variability of the percentages of whole grain in various "whole grain" products (66). One serving of a 100% whole-grain product (i.e., 0.5 cup of oatmeal or brown rice) contains ~15–20 g of whole grains (per dry weight). We considered 75 g/d to be optimal (~5 servings/d) for women and 90 g/d (~6 servings/d) to be optimal for men on the basis of current guidelines for total grains.
[5] Intake of sugar-sweetened beverages, including soda and fruit drinks, is associated with increased risk of weight gain and obesity (67), CVD (35), and diabetes (34). We included intake of fruit juice in this category, given the positive association with risk of diabetes (64) and lack of beneficial effects on CVD (61) or cancer (61).The association with pancreatic cancer risk is not well established (68). We considered ≥1 serving/d to be the least optimal on the basis of the associations in the literature. One serving is 8 oz (1 oz = 28.35 g).
[6] Nuts, legumes, and vegetable protein (e.g., tofu) are important sources of protein and contain important constituents such as unsaturated fat, fiber, copper, magnesium, plant sterols, and other nutrients. Red and other vegetable proteins have been associated with lower risk of CVD, especially when used as a substitute for other protein sources, such as red meat (41). Nuts are also associated with lower risk of diabetes (42) and weight gain (69), whereas their relation to cancer is inconclusive (70). We considered 1 serving/d to be ideal on the basis of the AHEI recommendations and the current literature. One serving is 1 oz (1 oz = 28.35 g) of nuts or 1 tablespoon (15 mL) of peanut butter.
[7] Consumption of red meat and processed meats is associated with greater risk of CHD (48), especially when substituted for nuts, poultry, or fish (41). Red meat and/or processed meats are also associated with higher risk of stroke (45,46), diabetes (47), and colorectal and other cancers (52,55). Less than 1 serving/mo was considered to be ideal, with an upper limit of ≥1.5 servings/d. One serving is 4 oz of unprocessed meat or 1.5 oz of processed meat (1 oz = 28.35 g).
[8] *trans*-Isomers of fatty acids, formed by partial hydrogenation of vegetable oils to produce margarines and vegetable shortening, are associated with higher risk of CHD (71) and diabetes (72). Cutoffs are consistent with original AHEI cutoffs for *trans* fat.
[9] One serving of fish per week, specifically of species high in long-chain (n-3) fatty acids EPA + DHA, is strongly protective against fatal cardiac arrhythmias and sudden cardiac death (73) and may lower the incidence of other CVD (43,74). EPA + DHA were associated with lower risk of diabetes in some (40,44), but not all (75), studies, and the relation with cancer risk is unclear. Because of the strength and consistency of fish and EPA + DHA on cardiac arrhythmias and CVD, we included this nutrient in the AHEI-2010 score. The cutoff for optimal intake (250 mg/d) is ~2 4-oz servings of fish /wk, which is consistent with current guidelines (1 oz = 28.35 g).
[10] Replacing saturated fats with polyunsaturated fats leads to positive changes in lipid profiles (63), is associated with a lower risk of CHD (36), and may lower risk of type 2 diabetes (76). Furthermore, a low-fat diet had no beneficial effects on CVD risk factors, lipid profile, or blood pressure and did not reduce the risk of CVD, breast cancer, colon cancer, or total mortality (77–79). We gave the highest score to individuals with ≥10% of total energy intake from PUFA on the basis of current guidelines from the USDA and the AHA (50,80). PUFA does not include EPA or DHA intake.
[11] High sodium intake has been associated with higher blood pressure (81), and salt-preserved foods are associated with greater risk of stomach cancer (52), CVD (54), and total mortality (82). Furthermore, sodium-reduced diets significantly lowered blood pressure (83) and CVD risk in clinical trials (84). Large reductions in sodium intake, to levels recommended by the USDA (60), may prevent a substantial number of new cases of CHD (33). The cutoffs for sodium were based on deciles of distribution in the population, due to lack of brand specificity in the FFQ to accurately estimate absolute intake. Values in lowest decile were ≈1112 mg/d in women and ≈1612 mg/d in men and in highest decile were ≈3337 mg/d in women and ≈5271 mg/d in men at baseline.
[12] In moderation, alcohol may be consumed as a part of an overall healthy diet. Moderate alcohol consumption has been associated with lower risk of CHD (85), dementia (86), diabetes (87), and all-cause and CVD mortality (88). However, in heavier quantities, alcohol increases the risk of certain cancers (52) and has other health and social implications such as alcoholism and alcohol-related injuries (89). Furthermore, many adults choose not to drink for various reasons. Thus, we assigned the highest score to moderate, and the worst score to heavy, alcohol consumers. Nondrinkers received a score of 2.5. We used gender-specific cutoffs, because the health effects of alcohol are seen at lower quantities in women than in men. One drink is 4 oz of wine, 12 oz of beer, or 1.5 oz of liquor (1 oz = 28.35 g).

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Figure 2

Diet Quality Screening Tool

1 In a typical week, how often do you:	Never/ Rarely	Some-times	Often/ Always
1. Eat 3 or more servings of **vegetables** a day (not including potatoes or french fries)? *Serving: 1/2 cup fresh, frozen, or canned vegetables, or 1 cup leafy greens.*	☐ 0	☐ 1	☐ 2
2. Eat 2 or more servings of **whole fruit** a day (not including fruit juice)? *Serving: 1/2 cup fresh, frozen, or canned fruit, or 1 medium piece.*	☐ 0	☐ 1	☐ 2
3. Eat 3 or more servings of **whole grain** foods a day? *Serving: 1 slice whole grain bread, 1 cup whole grain cereal, ½ cup oats or brown rice.*	☐ 0	☐ 1	☐ 2
4. Eat 1 or more servings of **refined grain** foods a day? *Examples: white rice, bread, pasta, cereal, & snack food that is not whole grain.*	☐ 2	☐ 1	☐ 0
5. Eat 1 or more servings of **sugary foods** a day? *Examples: candy, dessert, pastries, & cereal, or dairy products with added sugar.*	☐ 2	☐ 1	☐ 0
6. Drink 1 or more servings (8 oz) of **sugary drinks** a day? *Examples: soda, fruit juice, sports & energy drinks, lemonade, & powdered sugar drinks.*	☐ 2	☐ 1	☐ 0
7. Drink 1 or more cups of coffee, specialty coffee, or tea with **added sugar** a day? *Examples: table sugar, honey, syrups, & flavored creamer/milk.*	☐ 2	☐ 1	☐ 0
8. Eat 1 or more servings of **chicken** or **turkey** a day (minimally processed)? *Serving: 3 oz or the size of the palm of your hand.*	☐ 0	☐ 1	☐ 2
9. Eat 1 or more servings of **red meat** or **processed meat** a day? *Examples: beef, pork, lamb, or ham, hot dogs, bacon, sausage, & lunch meats.*	☐ 2	☐ 1	☐ 0
10. Eat 1 or more servings of **nuts**, **seeds**, (1 oz) or **beans** (½ cup) a day? *Examples: Nuts = walnuts & almonds; Seeds = pumpkin & flax; Beans = chickpeas & tofu.*	☐ 0	☐ 1	☐ 2
11. Eat 1 or more servings of **fish** during the **week**? *Serving: 3 oz or the size of the palm of your hand.*	☐ 0	☐ 1	☐ 2
12. Add **plant-based oils** to salads or to foods when cooking during the **week**? *Examples: olive, canola, avocado, sunflower, & flaxseed oils.*	☐ 0	☐ 1	☐ 2
13. Add **butter** to foods or eat **deep fried** foods during the **week**?	☐ 2	☐ 1	☐ 0
14. Add **salt** to food at the table or when cooking during the **week**?	☐ 2	☐ 1	☐ 0
15. Drink 1 or more **alcoholic drinks** a day?	☐ 2	☐ 1	☐ 0
2 Add up your scores for the 3 columns.			

3 Put your 3 column totals here. Then add up your 3 numbers.

_____ 'Never/Rarely' total + _____ 'Sometimes' total + _____ 'Often/Always' total = _____ Diet Quality Score

Excellent	26 - 30
Very Good	21 - 25
Good	16 - 20
Fair	11 - 15
Poor	0 - 10

Diet Quality Scores Scores can range from 0 to 30. The higher your score, the healthier. Each time you eat more high-quality foods or less low-quality foods, you improve your score.

Diet Quality Matters What you eat and drink impacts your health. Low-quality diet is a major risk factor for many chronic diseases including heart disease, type 2 diabetes, high blood pressure, obesity, stroke, mental health problems, and many cancers.

Path to Better Health The key is not to deprive yourself. Find little ways to eat more high-quality foods and less low-quality foods when possible. Even a small change to your existing diet can have a big impact on improving health and well-being.

4 Thinking about high and low-quality foods and my health:

1. Are you ready to make a small change to your diet in the next month? Yes ___ No ___
2. Are you ready to discuss your results with a health professional? Yes ___ No ___

Disclaimer: This screening tool provides a self-reported score of diet quality to guide counseling. The information provided is not a substitute for professional advice, diagnosis, or treatment. There is not one "perfect" diet for everyone, due to individual differences in age, sex, physical activity level, environment, and cultural heritage. Health conditions can play a role, too.

The Diet Quality Screening Tool uses the Alternative Healthy Eating Index as a reference.[1] The scoring system assigns more points for high-quality, healthy food intake, without overly penalizing limited amounts of low-quality, unhealthy food intake. This screening tool is not intended to assess your total diet.

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Methods

We carried out a SAM evaluation of the DQST consisting of 30 health care professionals. SAM consists of six evaluation areas: content, literacy demand, graphics, layout and typography, learning stimulation and motivation, and cultural appropriateness. A total of 22 specific items are distributed among the six evaluation areas, including four items addressing content, five items about literacy demand five items about graphics, three items about layout and typography, three items about learning stimulation and motivation, and two items abut cultural appropriateness. Each item is rated as 0 (not suitable), 1 (adequate), and 2 (superior).

Results

A summative score was calculated from the 22 items for all 30 reviewers. These summative scores were then divided by the total possible scores to produce a SAM percentage score. The overall SAM percentage scores were 81% placing it in the suitable index category of superior.

Conclusions

The DQST has a robust superior suitability index and can used in diverse clinical and community population-based settings.

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